Skylab: Stepping stone to today's ISS

By Lisa Tidwell

An overhead view of the Skylab space station cluster in Earth orbit as photographed from the Skylab 4 Command and Service Module (CSM) during the final fly-around by the CSM before returning home.

sl4-143-4706

Astronaut Jack R. Lousma, Skylab 3 pilot, participates in the August 6, 1973, extravehicular activity (EVA) during which he and Astronaut Owen K. Garriott, science pilot, deployed the twin pole solar shield to help shade the Orbital Workshop (OWS).

sl3-122-2611

Floodlights illuminate this nighttime view of the Skylab 3/Saturn 1B space vehicle at Pad B, Launch Complex 39, Kennedy Space Center, Fla., during prelaunch preparations.

s73-32568

The Skylab space station was launched May 14, 1973 by a Saturn V launch vehicle, the same kind that sent Astronauts to the Moon during the Apollo Space Program. The Skylab Program had two major objectives: to prove that humans could live and work in space for extended periods, and to expand our knowledge of solar astronomy well beyond Earth-based observations.

Successful in all respects despite early mechanical difficulties, three three-man crews occupied the Skylab workshop for a total of 171 days and 13 hours. It was the site of nearly 300 scientific and technical experiments: medical experiments on humans' adaptability to microgravity, solar observations and detailed Earth resources experiments.

Almost immediately after the unmanned Skylab 1 launch, technical problems developed due to vibrations during liftoff. A critical meteoroid shield ripped off, taking one of the craft's two solar panels with it, and a piece of the shield wrapped around the other solar panel.

Skylab was maneuvered so its Apollo Telescope Mount solar panels faced the Sun to provide as much electricity as possible for the station. Doing so without the now-lost meteoroid shield, however, caused workshop temperatures to increase to 126 degrees Fahrenheit.

Missions overview

Skylab 1
May 14, 1973, unmanned

Skylab 2
May 25, 1973 – June 22, 1973
Charles Conrad, Jr., Paul Weitz, Joseph Kerwin

Skylab 3
July 28, 1973 – September 25, 1973
Alan Bean, Jack Lousma, Owen Garriott

Skylab 4
November 16, 1973 – February 8, 1974
Gerald Carr, William Pogue, Edward Gibson

This year marks the 30th anniversary of Skylab

The first Skylab crew – Charles Conrad, Jr., Paul Weitz and Joseph Kerwin – was launched on May 25, 1973 to an unwelcoming station. The crew made substantial repairs, including deployment of a parasol sunshade, which cooled the inside temperatures to a more comfortable environment of 75 degrees Fahrenheit, and the deployment of the remaining solar array, which brought the power levels up enough to perform closely to the planned mission schedule.

In spite of the problems encountered, the first manned mission accomplished most of its objectives. During its 28-day stay, the crew conducted solar astronomy and Earth resources experiments, medical studies, five student experiments and three spacewalks totaling six hours and 20 minutes.

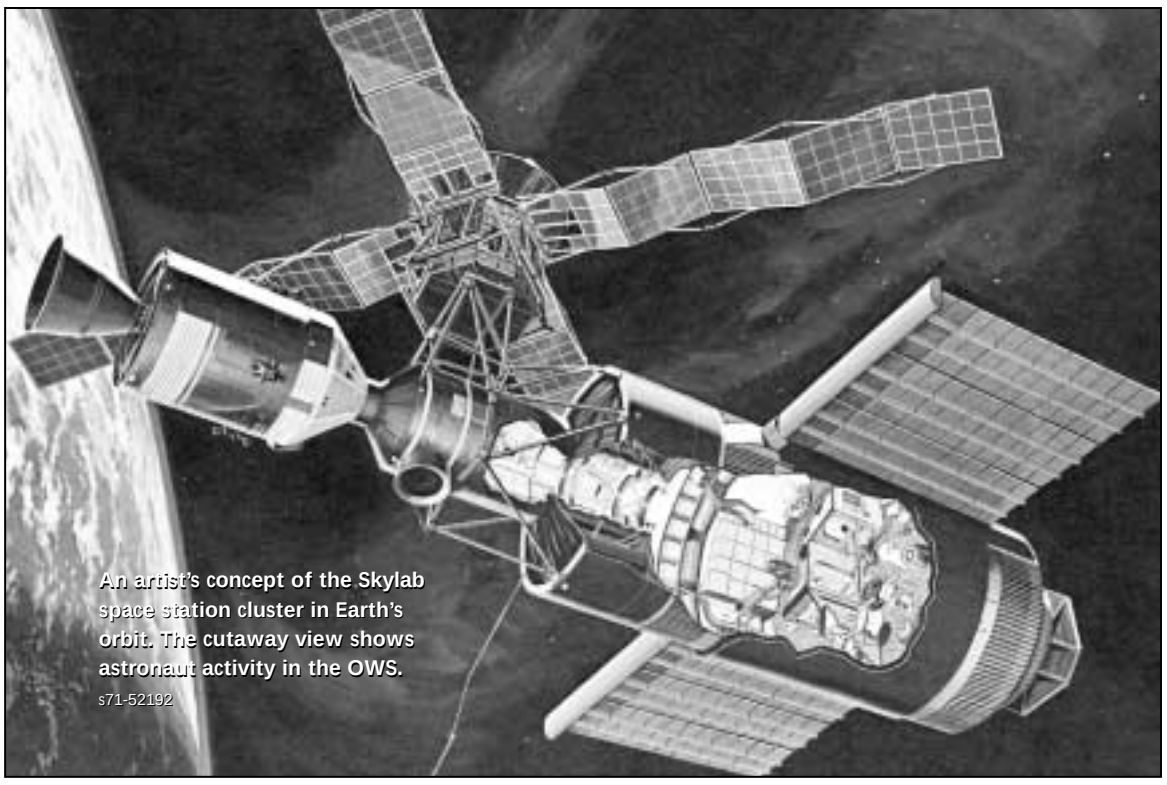
After the departure of the Skylab 2 crew on June 22, Skylab sat empty for six days awaiting her new crew. Alan Bean, Jack Lousma and Owen Garriott arrived at Skylab on July 28, 1973 for a 59-day stay aboard the space station. The new crew continued maintenance of the station, performed extensive scientific and medical experiments totaling 1,081 hours of solar and Earth experiments, and spent nearly 14 hours performing three spacewalks.

Skylab 4, launched November 16, 1973, was the last mission to the station. Gerald Carr, William Pogue and Edward Gibson called Skylab home for 84 days before closing the hatch for the last time. The last of the Skylab missions included an unplanned observation of the Comet Kohoutek among numerous experiments. The crew completed four spacewalks totaling more than 22 hours.

Following the final manned phase of the Skylab mission, ground controllers performed some engineering tests of certain Skylab systems – tests that ground personnel were reluctant to do while astronauts were aboard. Results from these tests helped to determine causes of failures during the mission and to obtain data on long-term degradation of space systems.

Upon completion of the engineering tests, Skylab was positioned into a stable attitude and systems were shut down. It was expected that Skylab would remain in orbit eight to ten years. However, in the fall of 1977, it was determined that Skylab was no longer in a stable attitude as a result of greater than predicted solar activity.

The empty Skylab spacecraft returned to Earth July 11, 1979 scattering debris over the Indian Ocean and the sparsely settled region of Western Australia.

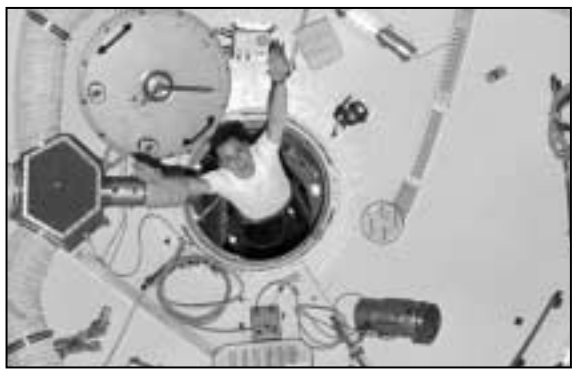


An artist's concept of the Skylab space station cluster in Earth's orbit. The cutaway view shows astronaut activity in the OWS.

s71-52192

Components of Skylab

- Orbital Workshop (OWS) – primary crew quarters and work areas, volume equivalent to a five-bedroom house
- Airlock Module (AM) – extravehicular activity port and station's control and monitoring instrumentation
- Apollo Telescope Mount (ATM) – solar observatory
- Multiple Docking Adapter (MDA) – docking ports and controls for the ATM and Earth resource instrumentation



FROM LEFT TO RIGHT

Astronaut Paul J. Weitz, pilot for the first manned Skylab mission, prepares to check out the bicycle ergometer in the work and experiments area of the crew quarters of the OWS trainer during Skylab training at the Johnson Space Center.

s73-20205

Scientist-Astronaut Joseph P. Kerwin, Skylab 2 science pilot, serves as test subject for the Lower Body Negative Pressure Experiment. Astronaut Paul J. Weitz, Skylab 2 pilot, assists Kerwin with the blood pressure cuff.

sl2-2-180

Scientist-Astronaut Edward G. Gibson, science pilot for the Skylab 4 mission, demonstrates the effects of zero-gravity as he sails through airlock module hatch.

sl4-150-5074

Scientist-Astronaut Edward G. Gibson, Skylab 4 science pilot, stands at the ATM console in the MDA of the Skylab space station cluster in Earth orbit

s74-17306

View of Astronaut Alan L. Bean, Skylab 3 commander, in his sleep compartment, reading a book.

sl3-112-1527

2003 Rotary Stellar Award Winners

INDIVIDUAL WINNERS

Angela Prince
Johnson Space Center

James Tsai
Boeing Rocketdyne

Bryan Corley
United Space Alliance

Joseph Martinez
Boeing Rocketdyne

Capt. Robert Bridges
United States Air Force

Donald Carter
Marshall Space Flight Center

Ralph Roe
Johnson Space Center

Maj. Rudolph Butler
United States Air Force
Space Command

David Wineland
Boeing Rocketdyne

Stephen King
Lockheed Martin

Laura Brozowski
Boeing Rocketdyne

Stephen Beckel
Pratt & Whitney

Charles Chase
Pratt & Whitney

John Talone
Kennedy Space Center

Daniel Hausman
Boeing Rocketdyne

Col. Stanley Mushaw
United States Air Force

TEAM WINNERS

ISS Cardiocog Battery Hazard Identification Team
Johnson Space Center

Miniature Autonomous EVA Robotics Camera Team
Johnson Space Center

Evolved Expendable Launch Vehicle Team
United States Air Force

Space Control Squad
United States Air Force

ISS Space Station Electric Power Team
Boeing Rocketdyne

Orbiter Flow Liner Investigation Team
Boeing

Roy Estess, former director of Stennis Space Center, was the recipient of the prestigious National Space Trophy for 2003. In his nomination of Estess, NASA Administrator Sean O'Keefe said, "Roy is recognized as a perceptive, objective and outstanding executive and leader, and his profound contributions are distinguished by both their breadth and impact."

Roy Estess (left) accepts the 2003 National Space Trophy from Center Director, Sean O'Keefe.
jsc2003e40316 All photos this page by Bill Stafford

Estess has more than four decades of service to the federal government and more than 35 years with NASA. A native of Tyler Town, Miss., Estess graduated from Mississippi State University with a degree in aerospace engineering. He joined NASA in 1966 as a test engineer on the Saturn V second-stage test program. In 1980, he was named Stennis' Deputy Director, becoming its Director in 1989. Estess then fulfilled a temporary assignment to NASA Headquarters from 1992-93, serving as a special assistant to two NASA Administrators. From February 2001 to April 2002, he was temporarily assigned as acting director of Johnson Space Center. During his tenure at JSC there were seven flawless Shuttle missions, the International Space Station became operational and the Hubble Space Telescope was serviced.

"Roy joined NASA at the height of the Apollo program and has played an instrumental role in the successful development of the Agency," said O'Keefe. "He literally grew up with NASA and has been an exemplary public servant and visionary manager throughout his career."

Estess has been the recipient of numerous awards and honors, which include the 2002 NASA Outstanding Leadership Medal, the 2000 Distinguished Service Medal, the 1997 Distinguished Presidential Rank Award, NASA's Distinguished Exceptional Service award, the 1993 Outstanding Leadership Medal as well as Citizen of the Year in his home town.

Astronauts Sandra Magnus and James Reilly II presented the 2003 Rotary Stellar Awards.

jsc2003e40702

Angela R. Prince (left)
Lead of MOD's Robotics Systems Group
NASA Johnson Space Center

Exceptional leadership of the Mission Operations Directorate's Robotics Systems Group and successful leadership through the most challenging period of Robotic Operations in human spaceflight history.

jsc2003e40309

Ralph R. Roe, Jr. (left)
Manager, Space Shuttle Vehicle Engineering Office
NASA Johnson Space Center

Motivational leadership and effective management for the Space Shuttle Program in the design, modification, certification and testing of the orbiter vehicle.

jsc2003e40314

Miniature Autonomous EVA Robotic Camera (AERCam) Team
Steven E. Fredrickson (left)
Computer Engineer
NASA Johnson Space Center

Outstanding innovation and technical excellence in developing and demonstrating Mini AERCam, a nanosatellite free-flying inspection robot intended for remote viewing inspection around human spacecraft such as the International Space Station.

jsc2003e40703

ISS Cardiocog Battery Hazard Identification Team
Christine Stewart (left)
Payload Safety Engineer
NASA Johnson Space Center

Identification, research and testing of serious safety issues with the Cardiocog battery, leading to a decision by the ISS program manager that the batteries should not be used on the International Space Station, contributing to the safety of ISS crew.

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Roundup

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